

## CLAIMS

1. An apparatus for detecting gear features, the apparatus comprising:  
a magnetic sensing element providing a first signal indicative of the presence of a gear feature;

5 a thresholding module operable to:

(a) receive the first signal and responsively provide a second signal;

(b) provide a reference signal;

(b) detect a first difference between the second signal and the reference signal, and responsively provide a third signal as a function of the first difference;

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(c) detect a second difference between the third signal and the reference signal, and responsively adjust the first signal (i) as a function of the second difference when the second difference falls below a given threshold and (ii) by a predetermined amount when the second difference satisfies the given threshold;

15 and

an output module operable to receive the reference signal and the second signal, and responsively produce an output signal as a function of a first and reference signals.

2. The apparatus of claim 1, wherein the first signal has a first portion representative  
20 of a first gear feature and a second portion representative of a second gear feature, and wherein the given threshold is chosen such that when the first portion contains an errant portion that indicates a false presence of the second gear feature when one is not present, the thresholding module adjusts the first signal by the predetermined amount so as to provide to the output module the second and reference signals without the false presence.

3. The apparatus of claim 2, wherein the output module produces an output signal as a function of a difference between the second and reference signals, and wherein when the thresholding module adjusts the first signal by the predetermined amount, the difference between the second and reference signals is maintained above a second threshold.

4. The apparatus of claim 3, wherein the second threshold is approximately equal to the given threshold less the reference signal.

5. The apparatus of claim 1, wherein the first signal has a first portion representative of a first gear feature and a second portion representative of a second gear feature, wherein the first portion occurs above a first magnetic field, and wherein the given threshold is set below the first magnetic field.

6. The apparatus of claim 5, wherein the output module produces an output signal as a function of a difference between the second and reference signals, and wherein when the thresholding module adjusts the first signal by the predetermined amount, the difference between the second and reference signals is maintained above a second threshold.

7. The apparatus of claim 6, wherein the second threshold is approximately equal to the given threshold less the reference signal.

8. The apparatus of claim 1, wherein the first signal has a first portion representative of a first gear feature and a second portion representative of a second gear feature, wherein the second portion occurs below a second magnetic field, and wherein the given threshold is set at or below the second magnetic field.

9. The apparatus of claim 8, wherein the output module produces an output signal as a function of a difference between the second and reference signals, and wherein when the thresholding module adjusts the first signal by the predetermined amount, the difference between the second and reference signals is maintained above a second threshold.

10. The apparatus of claim 9, wherein the second threshold is approximately equal to the given threshold less the reference signal.

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11. The apparatus of claim 1, wherein the given threshold is set at a predetermined magnetic field, whereby the thresholding module adjusts the first signal by a predetermined amount when the magnetic sensing element experiences a magnetic field satisfying the given threshold.

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12. The apparatus of claim 11, wherein the output module produces an output signal as a function of a difference between the second and reference signals, and wherein when the thresholding module adjusts the first signal by the predetermined amount, the

difference between the second and reference signals is maintained above a second threshold.

13. The apparatus of claim 12, wherein the second threshold is approximately equal  
5 to the given threshold less the reference signal.

14. An apparatus for detecting gear features, the apparatus comprising:  
a magnetic sensing element providing a first signal indicative of the presence of a  
gear feature;

10 an amplifier module operable to receive the first signal and responsively provide a  
second signal;

a detector module operable to detect a first difference between the second signal  
and a reference signal, and responsively provide a third signal as a function of the first  
difference;

15 a feedback module operable to receive the third and reference signals, and  
responsively adjust the first signal:

(i) as a function of a second difference between the third and reference  
signals when the second difference falls below a given threshold; and

(ii) by a predetermined amount when the second difference satisfies the  
20 given threshold; and

an output module operable to receive the second and reference signals, and  
responsively produce an output signal as a function of the second and reference signals.

15. The apparatus of claim 14, wherein the output module produces an output signal as a function of a difference between the second and reference signals, and wherein when the feedback module adjusts the first signal by the predetermined amount, the difference between the second and reference signals is maintained above a second threshold.

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16. The apparatus of claim 15, wherein the second threshold is approximately equal to the given threshold less the reference signal.

17. The apparatus of claim 16, wherein the first signal has a first portion  
10 representative of a gear tooth and a second portion representative of a gear slot, and wherein the given threshold is chosen such that when the first portion contains an errant portion that indicates a false presence of the gear slot when one is not present, the feedback module adjusts the first signal by the predetermined amount so as to provide to the output module the second and reference signals without the false presence.

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18. The apparatus of claim 16, wherein the first signal has a first portion representative of a gear tooth, wherein the first portion occurs above a first magnetic field, and wherein the given threshold is set below the first magnetic field.

20 19. The apparatus of claim 16, wherein the first signal has a first portion representative of a gear slot, wherein the second portion occurs below a second magnetic field, and wherein the given threshold is set at about the second magnetic field.

20. The apparatus of claim 16, wherein the first signal has a first portion representative of a gear slot, wherein the second portion occurs below a second magnetic field, and wherein the given threshold is set below the second magnetic field.

5 21. An apparatus for detecting gear features, the apparatus comprising:  
a magnetic sensing element providing a plurality of differential signals indicative of the presence of gear features, wherein the plurality of differential signals comprise a first set of differential signals representative of a first gear feature and a second set of differential signals representative of a second gear feature;

10 an amplifier module operable to receive the plurality of differential signal and responsively provide a second signal;

a peak detector module operable to detect a first difference between the second signal and a reference signal, and responsively provide a third signal as a function of the first difference, wherein the third signal tracks the second set of differential signals and  
15 then holds at a peak of the second set of differential signals;

a feedback module operable to receive the third and reference signals, and responsively adjust the plurality of differential signals:

(i) as a function of a second difference between the third and reference signals when the second difference falls below a given threshold; and

20 (ii) by a predetermined amount when the second difference satisfies the given threshold; and

an output module for receiving the second and reference signals, wherein the output module responsively produces an output signal as a function of the second and reference signals.

5     22.     The apparatus of claim 21, wherein each differential signal is proportional to a magnetic field.

23.     The apparatus of claim 21, wherein each of the plurality of differential signals comprises a high portion and a low portion, wherein the feedback module responsively  
10     adjusts the high portion by (i) the second difference when the second difference falls below the given threshold and (ii) the predetermined amount when the second difference satisfies the given threshold.

24.     The apparatus of claim 21, wherein the second signal is an inverse function of the  
15     plurality of differential signals.

25.     The apparatus of claim 21, wherein the first gear feature is a gear tooth and the second gear feature is a gear slot.

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